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# THREE LECTURES ON VOCATIONAL TRAINING

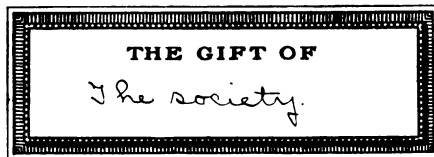
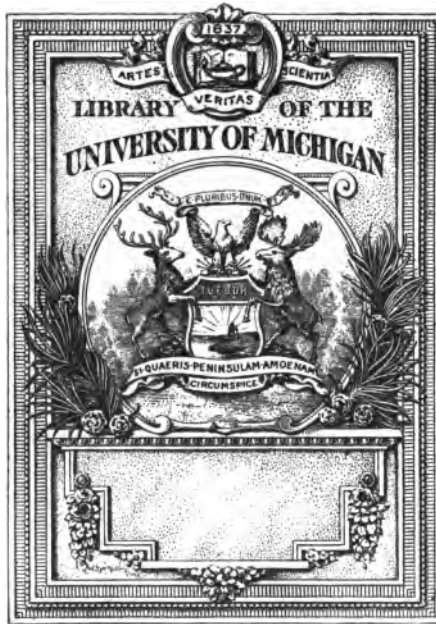
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DELIVERED IN AMERICA UNDER THE AUSPICES  
OF THE NATIONAL SOCIETY FOR THE  
PROMOTION OF INDUSTRIAL  
EDUCATION



PUBLISHED BY  
THE COMMERCIAL CLUB OF CHICAGO  
1911



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## THE FUNDAMENTAL PRINCIPLES OF CONTINUATION SCHOOLS

The wealth of a country depends not only on the natural riches of its soil, but also on the men who turn these riches to account. It has always been the aim of industrial states, or of states that desired to become industrial, to produce human material more and more fitted for their task. It was principally this object that induced absolute monarchs in Europe to establish primary schools. These schools were to contribute toward making industries, or, as they were then called, manufactures, a more productive source of state revenue.

But the farther we penetrate into the question of educating the masses to industrial capacity, the more we recognize that the problem before us is not special but general, that it is in fact nothing less than the problem of educating the whole man. Educational works in the United States are full of this discovery. In a description of the Lynn works Alexander Magnus says:

There are three main problems that enter into production: the machine problem, the material problem, the men problem. The latter is the most difficult problem, but also the most important one, in competitive activity.

In an article in the *American Federation of Labor* on industrial education I find the sentence:

There is a growing feeling that is gaining rapidly in strength, that in industrial education the human element must be recognized, and cannot be so disregarded as to make the future workers mere automatic machines.

This is perfectly true. The one-sided education of workmen to dexterity is only an apparent solution of the problem.

Of course industry requires an army of men trained to perform their special tasks as well as it is possible to perform them. But dexterity only attains its full value when it is based on insight. And one more thing is necessary. We require not only dexterity and insight but also the education of the moral character. Perhaps this development of character is the most important part even in industrial education, for firmness and principle will lead a man to acquire dexterity and insight, but dexterity and insight are not always placed in the service of character.

I do not assert that it always makes itself immediately felt, when any branch of industry neglects to train its workmen to insight and character. Many industries may profit for a longer or shorter period by their one-sided purely selfish training. But if all the industries of a state were to confine themselves to the development of dexterity, or even of dexterity and intelligence, the disadvantages of this method would soon make themselves apparent. For neither men, nor the states which they form, nor the industries which they carry on, can live an isolated life. They are all bound together by more or less common interests, linked together by a thousand chains. The individual is not only a workman in one branch or another, he is also a citizen of the state. And as a citizen his welfare and interests are inseparably connected with the welfare and interests of all other citizens. Every form of education, whatever its special aims may be, must seek to further the peaceful disentanglement of these interwoven interests—at least, that is to say, every form the realization of which requires schools supported by public money.

It might be urged—and I know that Americans favor this view—that it is not incumbent on the general community to provide more than a general education. To do this is both its right and its duty. But it has no duty and no right to use public money for purposes of specialized forms of education. This assertion cannot be justified. I have the conviction even that education for a calling offers us the very best foundation for the general education of a man. We are far too much

inclined to assume, both in the old world and in the new, that it is possible to educate a man without reference to some special calling. This assumption is erroneous. The only part of it that is true is that one calling requires more preparatory education than another, and that in our higher schools a common preparatory education can be given simultaneously for several learned and technical professions, exactly as the primary schools prepare their pupils for every kind of calling. We are also still far too much inclined to assume that early education for a calling must necessarily be a narrow and one-sided education. Yet it lies in our power to make an education for a calling as many-sided as any education can be. Well-nigh every calling, if treated with sufficient thoroughness, naturally involves an enlargement of the field of conception and activity. Science enters today into the simplest work and incites all possessed of the necessary gifts to develop their knowledge, their dexterity, and their initiative. Indeed experience has shown that the path of early education for a calling may lead to very much better results than the path of early general education with no definite calling as its goal. We might say, the useful man must be the predecessor of the ideal man. Everyone must be able to do some good and thorough work, though it be of the simplest kind, of one sort or another. Not till then will he be able not only to satisfy his fellow-men and be of use to his country, but also to make his own life of value to himself. And in the same measure as our lives gain value for ourselves do we attain power to reach a higher stage of culture.

If then the early education for a calling need by no means be one-sided or devoid of general value, if rather it is for most men, and especially for workers in industries, trades, and traffic, well-nigh the only way to reach a higher stage of culture, it cannot be regarded as a private matter; it becomes a matter of the community, a matter of the state. The reason for this does not lie in the advantages procured for any single branch of industry, but in the fact that this is the only road to civic education. Everyone who lives in a state and enjoys its pro-



tection must contribute through his work, directly or indirectly, to further the object of the state as a community for purposes of justice and civilization. Not till then is he a useful member of the state. And there can be no doubt that it is the duty of all schools supported by public means to educate useful members of the state.

Now if every individual is to contribute by means of his work to the general welfare of the community, our first business must be to provide him with the best opportunities of developing his skill and capacity for work. But the development of skill in his calling must not be placed only in the service of industry, or limited by industry. Its first object is the development of a man's own joy in work and thereby of his joy in life. For true joy in work can only grow out of real capacity for it. Thus the skill in work and the consequent joy in work that are cultivated in our trade schools prove themselves educational factors of the very highest importance. Through them we are able to appeal to the hearts of the boys and girls of our working classes. We can educate no one who is not happy in his work; and this is the point where we can intimately combine general and technical education. And there is no other way of doing this. It is possible to make use of skill in work and joy in work in an absolutely egoistic sense, and it is in this egoistic sense, unfortunately, that most technical schools approach their task. They only concern themselves with the individual, whom they endeavor to make as skilful as possible, while they pay no attention to the class as a whole. This is also the weak side of factory schools, which might otherwise be such admirable educational institutions for training intelligent and skilful workmen and artisans. It cannot be the interest of the manufacturer to give all his apprentices an equally good special and general education. He only concerns himself with the best among them, and not those with the best character but with the best intelligence and manual skill. Public schools have a very different object. They can and they must accustom the pupil betimes to use his joy in work and his skill in work in the service of his fellow-

pupils and of his fellow-men, as well as in his own. It is in their power to repress the general tendency of human nature to employ our gifts only for our own advantage. And it is their duty to repress this tendency, for if everyone were to use his gifts only for his own advantage there would be an end to all progress both for the industrial development of the nation and for the state as a whole.

✱ Pupils who have learned in schools of this kind to place their joy in work and their skill in work at the service of their comrades will then be able to learn the lesson that every school ought to teach, of uniting readiness of service, consideration for others, and loyalty, with insight into the aims of the state community. Naturally the limits of this insight will depend on the intelligence and age of the pupils. But even when the teacher is compelled to be content with little, the public school will always have means to accustom its pupils to the habitual exercise of civic virtues.

Our present schools have not yet fully grasped the meaning of this threefold task: first, education to skill in work and joy in work; secondly, education to readiness of service, consideration for others, and loyalty to schoolfellows and to the school; and, thirdly, education to insight into the aims of the state community. Well-organized schools fulfil the first task, the development of personal capacity. It still remains to enlarge them to schools for social service, and our most important task is to provide such schools for the mass of the population, based on training for a trade.

But the schools for the vast majority of our fellow-citizens, the real schools of the people, do not even suffice to fulfil the first task, for they leave off precisely at the point at which education by means of and for a special calling begins. This is the same in the United States as in Germany. Not only the struggle for life but also the struggle for education commences for millions of our country-men at the age of fourteen. The doors of the primary school have closed for them, the doors of a higher school open only to the favored few. The competition for daily bread drives the half-grown boys and girls into

the market. They take what they find. True, the question of the children's future has peered out of the background in the mind of parents and relatives, but there has been no time to answer it. Their eyes are fixed on the necessities of the moment. Posts are valued at the salary they offer, however unfavorable the conditions may be for intellectual or moral development. Some few have the force of character to struggle through untoward circumstances. Their intelligence, their will-power, perhaps also their home training, gives them strength to overcome the forces that drag men down. Some few have the good fortune to get into a factory or shop that has a natural interest in well-trained workmen. Some few find employers who do not regard the young hand as a cheap workman but as a human being who must be educated. But the innumerable mass of weaker and less fortunate youths, of whom thousands and thousands are also valuable human material, and the innumerable mass of real capacity, that find no warm-hearted employer and no employment demanding intellect, drift like shipwrecked men on the stormy ocean. Some reach the haven, after a loss of many years; the majority lead a life never brightened by the sun of joy in work. No one has ever taught them to seek the true blessing of work. No one has ever taken the trouble to point them to anything farther ahead than the daily task by which they must earn their bread their whole lives long. People tell us industry requires thousands of hands fit to perform the same manipulation with the same unerring skill hour by hour, month by month, year by year. I fully believe that industry does require them. Division of labor is the vital element of industry. But industry is not the aim of human society. The aim of society is the increase of justice and culture. And if industry permanently continues to recklessly disregard this aim it becomes a danger, not only for the state, but also, in the end, for itself as well. A democratic or even a constitutional state that is ruled exclusively by the lust of gain, by money and the machine slaves that money buys, is doomed to inevitable ruin, as soon as the natural riches of the soil become exhausted and the population becomes too dense.

Even the industrial state cannot dispense with strong moral forces. These forces grow, but not in a people of machine slaves and money princes. Moral forces, like skill in work, grow on no other soil than that of joy in work.

Now it cannot be one of the first objects of industry to further the development of a country's moral forces. Its first object is the profitable use of economic forces. The struggle for existence compels it to strain these forces to the uttermost, to press the greatest manual and intellectual capacity into its service, and therefore to train its workmen to the highest degree of dexterity. The capital invested in it clamors with reckless insistence for its interest. No one has better represented the psychology of gain-seeking capital than the great English painter George Frederick Watts in his picture "Mammon," that hangs in the Tate Gallery in London. It is true that capital brings untold blessings to men. But it rarely unveils this second face until it has ceased to be capital hungering for increase or until it has discovered, as it must sooner or later discover, that the third factor, moral capacity, cannot be neglected with impunity. And even after this discovery it long seeks to defend its position by ever stronger accentuation of the need of pure skill, sometimes even until it is too late for its own undertakings and for the state that has left it free play.

There is no escape from this natural fate of industry but state intervention, not too long postponed, to supplement the one-sided education afforded by industry, trade, and traffic. It is in fact an entirely new duty that has arisen for the community since the economic revolutions of the last century. It arose not only in the interests of industry but in the most vital interests of the community itself. It is the imperative duty of the state to create school organizations which deal with the trade-training of boys and girls, which enter into the question with the utmost thoroughness, enlarging and deepening it, and thereby awakening in boys and girls many-sided capacity for work and a living joy in work.

It will not be the object of this new school to replace the training now given in the practical work of factory and handi-

craft. It is impossible to replace the school of life, hard and yet so efficient, quite apart from the fact that it would be a financial, economic, and social impossibility to remove all youthful workers from workshops, offices, and factories, in order to train them in special schools. It is true there are some such schools that are intended to take the place of apprenticeship. We find them in all civilized states. But they are exceptions. As exceptions they may sometimes do good work, but seldom in the sense for which they were founded. For the better such handicraft and industrial schools are organized, the more surely do they outstep their intended limits. Their pupils are no longer satisfied with the position of workmen, and even those among them whose intelligence and skill give them no claims to high posts nevertheless seek to attain them.

The schools that we are considering here are continuations of the primary schools, and they can be organized in various ways. I say, they are a continuation of the compulsory primary school, that is to say, a school compulsory without exception for all who do not go to a higher school. The continuation schools accompany boys and girls during their apprenticeship to a trade, and do not forget those who are forced to spend the spring-time of their lives as day laborers, messenger boys, and unskilled workmen, far from the paradise of joy in work. They fulfil two purposes: first, youthful workers and apprentices are still at the disposal of trade and industry; second, no citizen of the state is left without an education extending up to his eighteenth year. The completeness of the school organization depends on the means which society can provide for the purpose and on the sacrifices which commerce, trade, and industry are ready and able to make. The schools are not merely technical or trade schools. They only make use of the pupil's trade as the basis of their educational work. The trade-training which they give is not the object of the school. However thorough this training in a continuation school, for instance, in Munich, is, it is still only the starting-point for the wider general training, for the education in practical and theoretical

thinking, in consideration for others, in devotion to common interests, in social service for the state community.

We Germans call them simply continuation schools. The conviction of their necessity for the whole life of the state has taken possession of the entire population more and more during the last twenty years. In South Germany there is no city or town, however small, without one such school, at least for all boys. In North Germany the great industrial town of Essen is the only larger town in which such a school is wanting. These schools are compulsory in Bavaria, Württemberg, Sachsen, Baden, and Hessen, for both town and country population, up to the age of sixteen, seventeen, or eighteen. They are not everywhere of equal educational value. There are still many town executives that have not yet been able to relinquish the old traditions out of which the schools arose as places for repetition of elementary school work. Not all those who are called upon to give judgment in this matter are thus far penetrated by the deep conviction that they have to deal with an independent school organism, requiring exactly the same budget, the same solicitude, and the same possibilities of expansion, as the primary schools. But everywhere the organizations are progressing, everywhere the representatives of industry and trade are, with few exceptions, beginning to realize that this new form of school can prove a blessing whenever its inner organization adapts itself to the calling of the boy or girl. Everywhere have these schools become an important affair of the towns and receive the willing support of the governments. The state subsidies in Prussia, which amounted to half a million marks in 1885, had risen in 1908 to three millions. The number of schools in Prussia rose from 664, with 58,000 pupils, to 2,100 schools with 360,000 pupils. In Württemberg a law was passed in 1906 requiring every town of over five thousand inhabitants to organize continuation schools for all apprentices in commerce, industry, and trade. Bavaria is preparing a similar law to transform the compulsory Sunday school for apprentices, which has existed for the last hundred years, with two hours' instruction, into a continuation school with six hours' instruc-

tion, for many country parishes. The Bavarian towns have already established continuation schools everywhere. Many Swiss cantons, especially Zürich, have done the same, and some Austrian crownlands, especially Lower Austria with the city of Vienna, have taken up the idea of developing the continuation school in the sense above indicated. In Vienna this autumn a central building has been opened for a continuation school, with something like sixty workshops, at a cost of eight million crowns. And in 1908 a law was passed in Scotland permitting every town to establish day continuation schools for apprentices of both sexes.

We must now consider from what points of view the organization of these schools must be undertaken. The question will be answered by the actual conditions under which the pupils live. If the continuation school, which can only take the pupils under its discipline for a small part of the week, is to exercise an educational influence on them, it must seek to take hold of the pupils by their egoistic interests in life, and to ennoble these interests in the process. The egoistic interests of the pupils are contained in their daily work. The conditions under which they carry on this work are in most cases very unfavorable, especially when the pupils are workers in large industries. The best thing that the school can do here is to raise the pupils' joy in their work. By so doing it is of use not only to the pupils but also to the industry. But it can only raise the pupil's joy in work by placing the practical work of the pupil himself in the center of all school work and by teaching the pupil to execute it as thoroughly as possible, to think out the processes of the work, to give reasons for them, and to make himself master of them. Thus it must be the business of the school to group the organization of teaching round this work, which is carried on in special workshops, laboratories, and other similar places. All other teaching, commercial, scientific, artistic, and moral, is brought into intimate connection with it. This enables the school by degrees more and more to enlarge the purely technical and mechanical training for a given calling and to let it take the form of ever-widening intellectual

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and moral discipline. Most industries and trades as well as commerce and agriculture allow of considerable development in these directions. The degree of general culture which the school can offer in these lines is not determined by the trade but solely by the time which the school has at its disposal and the intellectual powers of the pupils. In spite of all solicitude for the general education of its pupils, the school always remains on the firm ground of the real life by which the pupil is daily and hourly surrounded.

In all large towns and in all purely agricultural parishes it is always possible to gather most youthful workers together according to their calling in special continuation schools, in the center of which this calling stands. This kind of continuation school ought to be made compulsory for all boys and girls up to the age of seventeen or eighteen, or in any case as long as apprenticeship lasts. No reason exists why these schools should not be made compulsory. The state has established the compulsory primary school because it has recognized the necessity of a certain amount of culture for all the citizens of the state; the same recognition must lead to the compulsory continuation school. There are certain duties that every citizen must take upon himself, in the interest of the welfare of the state.

The time to be allotted to the continuation school must depend on the means at its disposal. I can imagine cases in which it might amount to two or three hours daily. In Germany it varies from six to twelve hours a week. As long as it is not reduced to less than six hours weekly, quantity is less important than quality. The evening hours must be excluded. Evening schools can only be established for voluntary pupils. Those who possess sufficient intellectual, moral, and physical strength will attend these evening classes in addition to the morning school, and not only for a time but consistently and regularly. The case is quite different for the majority of young persons, who do not possess this moral and intellectual power but nevertheless stand in need of education. For them it is of the first importance that instruction should take place during the day, within their hours of work, that the teacher may not have to



deal with a will still further weakened by fatigue. In Germany we have entirely given up holding compulsory continuation classes in the evening, when neither teacher nor pupil, especially in the winter months, is equal to his task. Most German states grant a subsidy only to towns that hold their continuation classes before seven o'clock in the evening. This is one of the cases in which sacrifices must be made by employers, by giving their apprentices the requisite time for school during the hours of work. The will to make this sacrifice was often extremely weak on the part of masters and manufacturers, but it received powerful support in the trade-regulation law of the German Empire, issued in the year 1897. According to paragraph 120 of these regulations every employer is put under the obligation to dismiss his apprentices from work at the hours appointed by the town for school purposes, under penalty of a fine. I must add that the masters and manufacturers, especially of South Germany, are almost unanimously reconciled to this order of things. Indeed some employers and guilds in Munich have offered to send me apprentices for longer instruction than the means at my disposal permitted me to provide.

The joy in work which diffuses itself throughout these schools must not be placed only in the service of intellectual and technical training, but no less in the service of moral training, or, as I call it, of civic education. For this reason the instruction must be organized as early as possible from the standpoint of free community of labor. Only in this free community of labor can the two fundamental civic virtues be developed, namely, consideration for others and loyalty to others' work. The workshops of the continuation schools, as we have them in Munich, afford every facility for carrying out this system: practical work leads in itself to the association of many hands for a common purpose, in other words, to communities of labor. But not only the practical instruction in school workshops and school gardens lends itself to this system; it can be applied with equal success to instruction in physics and chemistry, arithmetic, geometry, or gymnastics. Only at the first stage, when it is a question of initiating the pupil into the

elements of a subject, is it necessary to limit the instruction to him alone and seek to secure his individual progress. The individual must have attained a certain degree of proficiency before he can join a group for purposes of common action. That applies to the embryonic citizen as much as to the adult. But in all other respects, and in all schools, the whole plan of education must aim at turning as much school work as possible into work that can be done in common, at so arranging the tasks and the whole order of the schools that smaller or larger groups, or all the pupils together, are interested in the success of the work and are responsible for it.

There are two other factors that serve this end in the continuation schools. The first is the association of pupils in groups for free communities of labor, for purposes of self-improvement, of amusement, of physical training, or of practical charity. This is nothing new in England or America. On the contrary, we in Germany are indebted to your schools for the idea, and have much to do before we shall succeed in making it take root with us. We have nothing in our higher or lower schools to correspond to your leagues, societies, fraternities, gymnastic associations, debating clubs, clubs for musical purposes, etc. Many of these associations are admirably adapted for the continuation schools, and can be placed under the direct supervision of the pupils themselves. It is possible to introduce a regular system of self-government in other things as well into the continuation schools, if only one condition is fulfilled. The head of the school and his teachers must themselves be adept in the government of their own school and must know how to enlist the various student associations in the service of school interests.

The second factor is the co-operation of the employers in the trade taught at the school, in the common fulfilment of the school tasks. This second factor has been little realized in Germany, generally not at all. In Munich, however, I have endeavored, wherever it was feasible, to gain the interest of the employers for the school by conceding them certain rights and imposing certain duties. I will tell the manner in which

this was done in my second lecture. We must confess that the interest of employers in their apprentices' education has not increased during the last thirty years. We should gladly adopt every means in our power to awaken it afresh. The best plan is to induce the employers to make not only pecuniary but also personal sacrifices for the school, even when the school is a public one. We do not value a thing until it has cost us something. By these means we enlarge the field of education and the community of labor at the same time. We accustom a greater number of persons through the school to take not only a commercial but also a purely human interest in the apprentices and to bear their share in the cares of education. The plan has proved itself an excellent one in most cases, though not in all. The general recognition that the Munich continuation schools now enjoy on all sides is in large part to be attributed to the adoption of this plan.

When the continuation school has by these means become a true educational institution, not only for technical but also for moral education, then it will also have become a suitable medium for civic education and instruction. All teaching as to the aims and tasks of the state and the common interests of all members of the state has but little value as long as this teaching does not fall on ground already made receptive and fertile by corresponding habits of life. This applies especially to schools like the German continuation schools, with their limited hours of instruction and the quality of their pupils, who have so frequently received no good home training. The most thorough acquaintance with all the institutions of the state and all the duties and rights of the citizens does not in itself, as we know, suffice to make a citizen. A man may even be an admirable teacher of civic science and a first-class villain at the same time. We cannot develop character by teaching and precept until the organization of school and instruction has been laid out with the object of accustoming the pupil as far as possible to fair and upright dealing. As to the form that this civic teaching should take, I need say far less in your country than in Germany, where civic teaching was until quite

recently an unheard-of thing, and where people have learned by degrees that civic teaching must become one of the fundamental tasks of all public schools, as soon as the pupil is ready to receive it. A year ago I came across an excellent American book which showed me with how much common-sense and insight this subject is already treated in your schools and which in my writings and speeches I have repeatedly recommended my German countrymen to study. It is the book of Dunn's, entitled *Community and Citizen*, which appeared in the autumn of 1909. The book can be admirably applied to continuation schools, and I hope that some of my teachers in Munich will before long translate it into German, with the necessary revision of those parts that refer to exclusively American conditions. In my next lecture I propose to describe the details which show more clearly how we give civic instruction in our Munich continuation schools. The more we are able to base civic instruction on personal experience, that is, on the independent investigations and observations of the pupils, the more productive it will become.

The question remains whether the education of the masses which we call by the name of continuation school in Germany, and which we have realized in Munich and in some few country towns, is equally practicable in the United States. One great difficulty is doubtless the fact that in American trades and industries, if I am rightly informed, apprenticeship, as far as it still exists, does not begin before the age of sixteen, and that therefore so many of your boys and girls lose two of the years that would be most valuable for systematic education between the primary school and the commencement of apprenticeship. It should be the first care of educators to fill this great gap, either by prolonging the term of elementary education or by letting apprenticeship begin earlier, as it does in Germany. As a rule both boys and girls are ready to enter a calling at the close of their fourteenth year. In Germany at least we have no reason to be dissatisfied with our experience in this direction. From an educational point of view it is desirable to make fourteen the age for commencing, for there can be no doubt that working at a trade is or might be an essential factor in the formation of

character. Nothing strengthens character more than honest trade work, and I agree entirely with Mr. Hamilton, who said in his speech at Harrisburg last February:

The contribution that honest toil makes to the child-character is just as rich, possibly, as that of any other specific line of school work. Earnest, self-directed effort is the base of all habit and the very cornerstone of character. Nothing so crystallizes the crude charcoal of childhood into the diamonds of humanity as systematic self-directed effort.

What we have to beware of is that this industrial work, this "honest toil," does not degenerate into drudgery. And this danger will be avoided when a well-organized continuation school keeps pace with the period of apprenticeship, giving it meaning and thoroughness, making it many-sided, taking hold of and ennobling all its interests. Even the hardest work ceases to be a torment when we perform it with all our hearts. The introduction of industrial work or manual training into the upper classes of the primary school is without doubt a most useful undertaking in the interests of industrial education. We have long adopted this plan in Munich, although we have not carried it so far as the *écoles professionnelles* in Belgium and France. Indeed, from a social and economic standpoint it is much easier than the establishment of well-organized continuation schools. For the elementary classes do not have to struggle against the egoism of employers. But this cannot take the place of well-developed continuation schools. For the aim and end of all this training cannot be merely industrial education. Its aim and end is the education of the man, whom it will not permit to be identified with and lost in the workman. And the modern state can never hope to become a state of culture and justice till it has succeeded, by the right manner of instruction, in restoring to work, robbed of its divinity by the advance of industry, its educational powers.

## THE ORGANIZATION OF THE CONTINUATION SCHOOL IN MUNICH

In my last lecture I endeavored to show the principles on which the continuation school is organized and the relation it must bear to the whole life of the pupil. Before I describe the organization of the continuation school in Munich, it may be well to draw a picture of the characteristics which a continuation school ought to have, if it is to be a true place of education for the people, and perhaps also, in order to bring the form of the school into stronger relief, at the same time to state what it ought not to be.

The first fundamental principle of a rightly organized continuation school is that it must extend to the eighteenth year of every boy or girl who is not being educated in a higher school. It is of no advantage to a constitutional state to make its opportunities of culture accessible only to a small percentage. When all citizens of the state have the right to participate in its affairs and to exert influence on its executive through the suffrage, it is the business of the state to provide all with an education that will enable them to make a reasonable use of this right. During several decades we believed in Germany that it was sufficient to give opportunities for boys and girls to continue their education after quitting the primary school and to leave the use of such opportunities to their own free will. The United States, France, and especially England are still of this opinion. England points not without justifiable pride to the very large attendance at its night schools. The evening courses at the excellent School of Technology in Manchester were attended by twenty-five thousand pupils, while Munich, having four-fifths of the population of Manchester, had only about eighteen

thousand pupils in its compulsory continuation schools in the same year. But it is not enough to count only the number of pupils. We must also ask, How many hours' instruction does each receive? And we then find that in Manchester the pupil received sixty-three hours a year, while in Munich he received three hundred and thirty hours in the year.

In Germany everybody is now convinced that the voluntary continuation school no longer suffices for the educational needs of modern states. As long as the continuation school remains optional, thousands of employers will prevent their youthful workmen from making use of its opportunities, except at the end of their day's work, when mind and body are fatigued. And even in cases in which some reasonable employers would be willing to grant their boys time for study, they would probably do it only if the training in question were principally in the interest of their own trade. The number of employers who see farther and recognize that it is of the greatest importance not only for business but also for the community at large not to let the man disappear in the workman, but to take his moral and civic education in hand betimes, is too small to achieve any appreciable progress in the universal education of the people by means of purely voluntary continuation schools. We must remember that a voluntary continuation school will not reach those who need it most, that is to say, the innumerable boys and girls in our large towns who have a family only in name or no family at all. No one will voluntarily seek an opportunity of culture after the burden and heat of the day, unless he already possesses certain moral qualities that incite him to attend to his own education at the cost of trouble and inconvenience to himself. These are the reasons that have convinced us in Germany that compulsory attendance at the continuation school between the ages of fourteen and eighteen is absolutely indispensable.

But if this compulsory continuation school is to be in reality a home of education, it must in the second place engage the interest of its pupils. But it can engage their interest only if it interweaves its teaching with the trade of the pupil. For

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### Announcement of Research Studentships for 1911-1912 in the Department of Social Investigation

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The Department of Social Investigation of the Chicago School of Civics and Philanthropy which is maintained on the Russell Sage Foundation, offers for the year 1911-1912 a limited number of research studentships, the value of which will be \$350.00 and tuition.

Students in this department are required to give approximately two-thirds of their time to practical work in connection with the inquiry which is being carried by the department, such as the Juvenile Court investigation or the recent inquiry into tenement house conditions in Chicago; the remaining one-third of the student's time is given to required courses in the department of general training and to the seminar conducted by the directors of the department.

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the most capable pupils desire to get on in their trade and by help of their trade. Many have made it their choice from inclination, and have a lively interest in its technicalities. This is a perfectly justified interest. If the school appeals to this interest it may be sure of gaining the heart of its pupil. And if it has gained its pupil's heart it can lead him whither it will, on to *theoretical* as well as *practical* ground, and particularly on to the ground of moral and civic teaching.

Now if the school is to be brought as much as possible into intimate contact with the life of the pupil, it must, in the third place, possess workshops and laboratories for practical work as the center of its entire organization. There it can ennoble and intensify the work of boys and girls, and put processes that too frequently approach them only in a purely mechanical aspect on the basis of practical and scientific reflection. The youthful worker of present-day economic life has in no way remained an object of education in the same sense as was the apprentice of four or five hundred years ago, in the times of rigorous guild regulations. He has become more and more an instrument of cheap labor. The larger the business, the more one-sided is often the apprentice's training, and the smaller the business, the more insignificant is generally the work intrusted to him. If then the pupil is to learn the meaning of real joy in work this school must fill up the gaps left in the boy's education by the present economic conditions of life. It can do this only if it takes in hand the pupil's practical work and makes this the center of its entire system of teaching.

If the school stopped here, however, it would but imperfectly fulfil its purpose. The end of all education is not the technically competent workman, but the citizen of the state, who not only seeks to advance his own welfare through his work, but also consciously places his work in the service of the community. The fourth essential of the continuation school is therefore the attitude of regarding technical education only as means for mental and moral training. I have already pointed out in general terms how the organization must be adapted to this object, and propose to show it more clearly now by the example of

Munich. Not until the organization has entered on this path will the continuation school prove itself valuable enough to justify the large expenditure which it requires.

It would be extremely one-sided to establish schools of this kind for men workers alone. The more the population of a country increases and the harder the struggle for existence consequently becomes, the more is the wife obliged to contribute to the support of the family and the more pressing is therefore the necessity of giving girls opportunities of training, not only in the household knowledge that helps to preserve a family from ruin, but also in the different branches of trade by which she may later earn a livelihood. Indeed in greatly overpopulated states the continuation school is even more important for the girls than for the boys. In our great factory centers, where husband and wife go out to work, family life and family education are in innumerable cases well-nigh annihilated. Thus a new source of danger for the life of the state arises. If it were possible to develop a strong family feeling and to re-instate the family in its old educational functions by training women to their duties as mothers and housewives and giving them the opportunity of performing these tasks our anxiety for the education of growing lads would be considerably reduced. The difficulty of organizing continuation schools for girls lies in the fact that these schools have to fulfil a twofold task. In the first place a girl must be trained for her vocation proper as mother and housewife, and in the second place, marriage being uncertain, for a calling by which she can support herself. It is therefore necessary for both elementary and continuation schools to keep these two objects in view. As long as the time at its disposal is too short, it will have to pay chief attention to the training of the housewife and mother and then turn to the training for a vocation.

It is very probable that most towns will have financial difficulties in equipping really good continuation schools for both boys and girls at the same time. The municipalities will be obliged, as has been the case in Munich, to content themselves at first with establishing the compulsory continuation school

for one sex. The better the school is organized, the more surely in the course of time will public opinion demand the same schools for the other sex and find ways and means to support them from the public purse.

Before I proceed to give you a picture of the Munich organization, let me place before you a short sketch of the entire school system of the town. The primary school is compulsory for boys from six to fourteen, for girls from six to thirteen. The number of primary-school pupils is seventy thousand in a population of five hundred and eighty thousand. All children from the day-laborer's up to the prime minister's attend these schools. No fees are paid.

Kindergartens for children from the age of three to six are attached to most primary schools. Attendance is voluntary and not free of charge.

Girls and boys who pass up to higher schools to prepare for the professions of scholars, engineers, clergymen, higher state officials, etc., leave the primary school at the age of ten. There are thirteen public and fourteen private schools for this purpose (*Gymnasias*, *Realschulen*, *Oberrealschulen*, and higher girls' schools). Attendance is not free of charge, but very cheap—about one dollar a month.

The compulsory primary school is followed by the compulsory continuation school for all boys and girls who do not attend a higher school. Attendance is compulsory for boys during the whole of their apprenticeship but not beyond their eighteenth year; it is compulsory for girls for three years. Attendance is free of charge. The compulsory continuation school for boys is again followed by an optional continuation school for persons over eighteen, which was attended last year by two thousand six hundred pupils, and represented at least twelve hours' weekly instruction. Attendance is not free of charge, but also very cheap—fifty cents to a dollar a month.

The compulsory continuation school for boys has eight to ten hours' instruction weekly. The compulsory continuation school for girls has at present only three hours' instruction weekly; from the year 1912 it will have six hours. But side by

side with this compulsory continuation school are a voluntary continuation school, with six to twelve hours' instruction weekly, and a voluntary eighth class in the primary school with thirty hours of instruction a week.

The compulsory continuation schools for boys contain in round numbers nine thousand four hundred pupils; the compulsory continuation schools for girls contain seven thousand five hundred pupils, the voluntary continuation schools for girls, including the eighth class, three thousand seven hundred pupils. All in all, therefore, there are about twenty thousand pupils under eighteen years of age in these continuation schools. In addition to these there are ten thousand pupils in the higher boys' and girls' schools of the town (seven thousand boys and three thousand girls).

Thus about one hundred thousand children, that is, 18 per cent of the entire population and 93 per cent of all the boys and girls between six and eighteen in Munich, attend the public schools of the town.

The nine thousand pupils of the compulsory continuation schools for boys are distributed in fifty-two trade schools and twelve general schools. The trade schools are attended by all boys who are apprenticed to any trade, the general schools by unskilled workmen (about eleven hundred), day laborers, barrow men, errand boys, and servants. These general schools also receive the apprentices of trades that are too small to have special trade schools established for them.

The seven thousand five hundred girls in the girls' compulsory continuation school are distributed over forty schools in the town. They receive without exception household teaching. Twelve hundred of the three thousand seven hundred pupils of the voluntary continuation school are in the voluntary eighth class, thirteen hundred in the household department of the continuation school for girls, nine hundred in the commercial, three hundred in the trade department. The classes of the voluntary continuation school for girls are distributed in twenty-one schools.

A trade school is established in Munich for every trade that

has at least twenty-five apprentices. Trades with a great number of apprentices (such as machine-builders, mechanics, locksmiths, joiners, bakers, butchers, publicans) have at their disposal several trade schools in different parts of the town, in order to shorten the distance to school. The only exception is that the twelve hundred commercial apprentices are housed in a single building in the center of the town.

The apprentices' trade schools, with their higher divisions for journeymen and masters, that is, with their voluntary continuation schools, are distributed in seven schoolhouses throughout the town. One of these schoolhouses contains only the commercial apprentices; a second principally the different branches of painters, a third the various building and arts trades, a fourth the printing and reproducing trades, fine mechanics and machine locksmiths, a fifth the different kinds of wood-workers. The butchers' trade school is combined with the town slaughter-house. The gardeners' trade school has its own grounds. Six of the fifty-two trade schools are still in the buildings of the primary schools.

All trade schools are under the direct supervision of nine head-masters or directors, with sub-directors for each single school.

To most trade schools is attached an association of employers, who bear the expense of school material, take part in the discussions on the plan of instruction, have the right of proposing technical teachers, assist in the supervision of the practical subjects, co-operate in the examination of apprentices, and help to spread interest in the school and to further its prosperous development. This intimate connection of an employers' association with the aims and tasks of a trade continuation school established by public money has in many cases proved an exceedingly useful arrangement. The interest of the employers in the education of the apprentices is considerably increased. And when this is achieved, the association naturally does not content itself with furthering the education of the apprentices in the school alone, but seeks to raise the standard of their

calling in their own workshops as well. This is of course a process that takes place very gradually.

Each continuation school also possesses its own school board, consisting of a head-master of the trade school, a member of the municipality, and three employers of the trade. It is the business of this board to manage the affairs of the school and especially to keep watch on the regularity of attendance.

Every apprentice spends one whole day or two half-days of his working week in a trade school. As a rule this involves a reduction in wages. Some employers' associations, however, pay wages on both school and work days.

In the fifty-two trade schools there are about one hundred and twenty teachers entirely attached to the school and about three hundred who give lessons there in addition to other work. The teachers are recruited from all kinds of professions and vocations. Academic and normal-school teachers co-operate with master-workmen, journeymen, artisans, and agriculturalists; and they exert an excellent influence upon each other. The artisan, the master, and the journeyman learn to respect the schoolmaster, and the schoolmaster learns to respect the workman, who is engaged with him on the same educational problem.

The yearly expenditure for the compulsory apprentices' trade schools and for the voluntary journeymen's trade schools amounted last year, aside from the annual building expenses, in round numbers to 900,000 marks. The individual continuation-school pupil therefore costs about 80 marks, whereas each primary-school pupil costs 93 marks, and each pupil in the higher schools 200 marks. The expenses of the primary school are borne principally by the town, the expenses of the higher schools are with few exceptions borne by the state, and the expenses of the continuation school are borne by state and town together.

The annual net expenditure for the compulsory and voluntary continuation schools for girls amounts to about 400,000 marks, and is borne by the town alone.

So much for the external organization. When we turn to the internal organization of the compulsory continuation school,

we find, as already pointed out, practical instruction in workshop, laboratory, shop, and garden in the center of every apprentices' trade school. This instruction represents two to three hours a week.

Teaching in drawing and arithmetic is most intimately connected with this practical instruction. Nothing is drawn that has not been made in the workshop. And every process in work or construction is followed out in figures. By making out both preliminary estimates and bills the pupil learns the value not only of material and work but also of the *time* that has been spent upon the work. It is particularly useful for the apprentice to recognize by these bills how much the time he has spent on the work—and this of course is very great with apprentices—increases the cost of production. Special care is taken in making out bills and estimates to let the pupil learn to calculate not only the cost of materials and time but also all other items of cost, arising from the deterioration of machines and tools, the interest on capital, carriage, and various other sources of expense.

Practical instruction is also intimately connected with the study of materials, tools, and machines. The pupil makes acquaintance with these almost exclusively through his own practical work. He is especially familiarized with the mechanical laws under which machines and tools work.

Moreover, whenever the work in hand demands a knowledge of physics and chemistry to show the pupil the reasons for what he does, or teach him how to make new experiments with success, he receives instruction in special laboratories in the conceptions and laws required for well-considered work.

The technical education of the apprentice is never planned with a view to letting him make masterpieces. On the contrary, we endeavor to let him find pleasure in simple, careful, thorough, conscientious work in genuine materials, and to encourage him to new attempts through the feeling of security in his own power.

His moral insight is enlarged by German lessons. We read good authors in class and place at the pupil's disposal a selection of good books from the school library for reading at home.



In addition to this the pupils have one lesson weekly in religion up to their sixteenth year.

Civic instruction is generally planned as follows in the different trade schools: First, the historical development of the trade to which the pupil belongs is discussed. He is shown in the struggles of his fellow-workers the continually growing interdependence of interests among all citizens of a community. Concrete examples of devotion to a common cause are placed before him. Thus by degrees he recognizes how the problems arose which occupy town and nation today, and learns the duties and rights of the individual within the state.

This insight is strengthened into the will to consider others and to devote himself to common purposes by the association of pupils in working groups, especially in the last school year.

Hygienic training is given not only by special instruction in hygiene, but also by gymnastics and games on Sunday afternoons and during the school holidays. An association of young men of the cultivated classes, especially young army officers, places well-trained leaders at our disposal on Sundays, who take hundreds of apprentices for walks in the environs of the town.

The association of apprentices among themselves outside the schools, for the pursuit of common interests, is, on the other hand, but little developed. This is a kind of thing that cannot be done by command—it must grow out of the spirit of the school. Not only is the organization still too young for this, but the whole conception of pupils' associations is still too young in Germany. In one school alone—a higher mercantile school for girls—has an institution of the kind been developed with eminent success, thanks to the devotion of the head-master. And in one trade school for boys a mutual-assistance fund managed by the boys themselves works very well. But these examples are still isolated ones.

The organization I have described at present exists in this complete form only in Munich. I have already said that Württemberg has adopted the same organization for the whole country, that similar institutions are to be found in Baden, that the canton

of Zürich in Switzerland has quite recently promulgated a new Continuation School Law which in many respects resembles its Munich predecessor, and that, finally, the city of Vienna has erected at a cost of eight million crowns a central building for apprentices' continuation schools, the framework of which is exactly the same as in Munich. Thus it is seen that South Germany, Austria, and German Switzerland have started on the road of Munich's continuation-school organization. Also in North Germany the greatest energy is being expended on the problem of compulsory continuation schools, but at present without any attempt to base the organization on the school workshop.

The reason for this must be sought not only in the fact that pedagogical opinion in North Germany is still very strongly permeated with the idea of so-called general culture, but also in the difference between the South German and the North German employer. The latter is mostly an ardent opponent of the school workshop. And another reason is perhaps the difficulty with which organizers and schoolmen can make up their minds to accept the innovations of a colleague. It is a fundamental characteristic of human nature that everyone who has a question to solve likes to have contributed his own share to the solution. There is a German riddle that illustrates what I mean: "What is the difference between God and a German professor?" And the answer is: "God knows everything, and the German professor knows everything better." This "knowing better" is always a hindrance to the quick realization of a good thing. I do not wish to throw a stone at anybody. For we can all make the same observation about ourselves. We are all inclined to know things better than our colleagues. Especially when we have worked on a special hobby, consistently and energetically, for many years, it is unspeakably difficult so to enter into the ideas of another man, who does not agree with us, that we can do him justice on all sides. Nevertheless experience will show in the case in question that the purely theoretical continuation school which entirely avoids practical teaching will not fulfil its purpose. In your country it is hardly probable

that this experience will be necessary. You have already excellent school workshops in schools of the most various kinds, the value of which for the education of the man as opposed to the workman has been brilliantly demonstrated in the publications of the National Society for the Promotion of Industrial Education. The essential reason why the continuation school should not become a purely theoretical school is that its limitation to theoretical instruction would form an almost insuperable barrier to transforming our schools into educational institutions for community life. The transformation of schools into institutions of this kind, or, as I express it, into communities of labor, is the fundamental problem of all school organization. Its solution is the task of the present century. As long as our schools of all kinds, not the continuation schools alone, are not organized as communities of labor, they will not prepare their pupils as they should for the great labor-community that surrounds us, the state. I can give no better illustration of what I mean than in a quotation from your excellent countryman, Professor John Dewey, in his *Moral Principles of Education*:

I am told that there is a swimming-school in a certain city where youth are taught to swim without going into the water, being repeatedly drilled in the various movements which are necessary for swimming. When one of the young men so trained was asked what he did when he got into the water, he laconically replied: "Sunk." The story happens to be true; were it not, it would seem to be a fable made expressly for the purpose of typifying the ethical relationship of school to society. The school cannot be a preparation for social life, excepting as it reproduces, within itself, typical conditions of social life.

All our present schools are such swimming-schools on dry land, as far as social education is concerned. We may give our pupils a vast amount of instruction as to their relation to state and society. But we do not accustom them to regard their work from this point of view, and we give them no opportunity of making practical use of their knowledge in the service of their fellow-pupils. Our schools are therefore no schools for social service. But nothing could be better adapted for this purpose than the continuation schools I have described, in as far as they are intimately combined with workshops and labora-

tories. For there is no place more suitable for uniting pupils for community of labor than workshops, laboratories, and experimental gardens.

The only path to real state-community is to accustom the children from their earliest years to do their work not only for their own personal advantage but also for the advantage of their youthful companions. Only thus can we hope to develop the two great fundamental virtues of devotion to aims outside ourselves and of consideration for the interests of others. And only thus will it in all probability be possible to preserve our great modern constitutional states from the dangers that threaten them through their own industrial, economic, social, and political development.

## THE TECHNICAL DAY TRADE SCHOOLS IN GERMANY

The development of German industry and of German commerce since the foundation of the German Empire is one of the phenomena which both we at home and our neighbors around us regard with astonishment, and which force us involuntarily to ask what were the intrinsic causes that brought this development to pass. Hand in hand with it we see also the advance of the entire system of technical schools. All German states are paying increasing attention to these technical-school systems. The sums paid from the public purse for technical instruction have reached a height unknown before. In Prussia, the largest state in Germany, the state expenditure for continuation and trade schools amounted in the year 1886 to 570,000 marks; this expenditure rose in the year 1893 to 2,300,000 marks, in the year 1903 to 6,300,000 marks, and attained in the year 1908 the height of 12,000,000 marks, or, in round numbers, three million dollars. The expenditure for technical schools has risen in a similar manner in Austria, where it amounted, with the exclusion of Hungary, in the year 1896 to 5,200,000 crowns, in the year 1906 to 10,300,000 crowns, and in the year 1908 to 14,500,000 crowns.

It is natural to presume that these rapidly rising curves of industrial development and technical training both at home and abroad stand in intimate connection with one another. We may be inclined to give technical training credit for a considerable portion of this industrial development; for it might be reasoned that technical training must have preceded the visible results of this training. But it is equally possible that industrial development preceded the development of technical training, and that thus the requirements of industry were the direct or indirect causes for the establishment of new technical schools. And it is

also quite possible that though our technical and commercial schools have not failed to influence the development of German industry and trade they have by no means been the determining factors in it.

It is not my object at present to investigate these questions. Some of the answers will present themselves in the course of our inquiry into the development of German technical schools, their number, scope, and ideals.

In spite of the great expansion of the technical-school system in Germany, it is not difficult to obtain insight into its essential features, owing to the German tendency to unification, and especially to the fact that the schools have arisen partly or entirely through state initiative. It will be advisable to distinguish three groups of schools, according to the grade of training to which they aspire. German industry and trade require, precisely like the German army, a number of intellectually highly-trained officers, a number of well-trained subalterns, and an army of efficient soldiers.

The group of technical officers is almost exclusively recruited from the German technical colleges. These institutions are open only to students who have passed through the nine classes of the secondary schools. They educate the technical leaders of industry and also the state and municipal officials who are intrusted with the execution of technical problems. They receive their pupils after a school course of twelve or thirteen years, including the primary and secondary school, running from the pupil's sixth to his nineteenth year. Frequently a year of practical work is thrown in between the secondary school and the technical college. These technical colleges supply us for the most part with the higher technical heads of factories, whose duty it is to strike out new paths and discover new tasks and methods.

Two different kinds of schools exist for the training of subaltern officers: the middle and the lower technical training schools. The technical middle school expects its pupils, as a rule, to possess the knowledge and dexterity that are acquired by a six-year course at a higher secondary school. This six-

year course is a continuation of the first four years in the primary school. Its concluding examination gives throughout Germany the right to serve one year in the army instead of three. Two years' practice in the workshop is generally required before admittance to these technical middle schools. It is the purpose of these schools to provide industry with skilled men, who can serve immediately under the technical leaders as competent helpers either in the office or in the works. They also train the subaltern technical officials for the municipal and civil service. The time allotted them for this task is from two to two and a half years. The pupil is therefore about twenty years of age when he leaves school. (Compare also in *Abhandlungen und Berichte über technisches Schulwesen* the report of Director Rommberg of Cöln, p. 83.) In place of the qualification for the one-year military service that is gained by the concluding examination of a school with six classes, the pupil can undergo an entrance examination for the technical middle trade school.

In addition to these schools there exist a great number of technical lower trade schools for the training of foremen, engine-fitters, masters, or other lower officials for the constructive and business departments of works and factories. The conditions of admittance are graduation from the primary school (with eight classes) followed by at least four years' practical work. In other words, only thoroughly trained workmen are received in these schools. The period of instruction varies from one to two years. Foremen proper, as required in industries, that is to say, workmen placed at the head of a group of other workmen in factories, are as a rule not trained in either of these trade schools. These men must be possessed not only of sufficient technical experience but also of special qualities of character, which are inborn and cannot be acquired in a two years' school curriculum. In the opinion of most German manufacturers it is best to take these foremen from the ranks of the most capable workmen. What they lack in technical training is supplied by the third group of schools.

This third group of schools might be designated as technical

workmen's schools. They are spread all over Germany, in the shape of continuation schools, factory schools, apprentices' schools, Sunday and evening schools. Their essential characteristic is that school attendance generally runs parallel with the training in practical work. In all large and most small towns of Germany, apprentices and other youthful workers are under the obligation of attending a continuation school for from six to nine hours weekly during the working days. This continuation school must as far as possible take the practical work of the apprentice as the basis of its teaching. In some few cases factories have established schools as part of their organization, in which every apprentice without exception receives higher instruction for from two to four hours daily. In other places, again, special apprentices' schools have been established for locksmiths, machine-builders, joiners, weavers, plumbers, etc., which take the place of the ordinary apprenticeship. Moreover in all German towns evening and Sunday trade schools exist for workmen, similar to those common in England and America. I class all these schools together under the name of technical workmen's schools.

In many cases these technical workmen's schools are affiliated with the technical middle schools. They make use of the same workshops and classrooms and have the same teachers. The more gifted pupils can go up from the workmen's schools to the middle and even to the higher technical schools, provided, in the latter case, that they are able to pass the entrance examination. They have a considerable advantage over many pupils of these higher schools in their thorough practical training. This is a point on which of late years special stress has been laid in admittance to the lower and middle trade schools. Only as an exception and under quite peculiar circumstances is it considered advisable, in the interest of industry, to admit young men to the lower trade schools who have been trained, not in the workshop, but in the office. The possibility of thus moving up from one school to another not only provides industry with capable workmen but also builds a ladder by which men from the middle and poorer classes may mount up to better-paid posts. The



technical middle schools thus also supply a social want. On the other hand it is, as a rule, impossible in Germany for a pupil who has passed through the technical middle school to enter the technical colleges as a matriculated student, and thus to gain the qualification for a leading officer of industry. The only technical middle school that accords its pupils the right of matriculation as students in the technical courses of the university is the Trade Academy of Chemnitz in Saxony. There is no other German school of the same kind. Industry, however, pays little attention to this system of qualification, and although the pupils of the technical middle schools rarely become students in the technical courses of the university, we nevertheless not infrequently see them in higher industrial posts. Englishmen and Americans will find it difficult to understand such rigorous distinctions, for they are more accustomed than we in Germany to inquire not what school a man has attended but what he has learned and what he can do. Yet the German system is not altogether without justification. Examinations rarely give a true picture of a man. We rarely succeed in so ordering them that memory is not placed at an advantage over real capacity. But in spite of the fact that a man's best qualities generally remain hidden from the examiner, our technical colleges in Germany, which have a very high standard for the training of engineers, analytical chemists, and architects, must demand a fairly homogeneous and intellectual preparatory training if their scientific training is to proceed on the same lines as heretofore. This homogeneous and intellectual training is as a rule to be had only in the German nine-class middle schools which begin after the first four classes of the primary schools. It would be of the greatest danger to Germany's industries if the scientific standard of her universities were to be lowered.

The technical middle schools, or, as I have called them in the title, the technical day trade schools, do not exist for all trades and industries in Germany. The industries in the service of which such schools have already been established are the various kinds of metal industry, textile industry, wood industry, shipbuilding, smelting works, and foundries. Another group

of these day trade schools belongs to the building trades, both above ground and under ground, carpentry, masonry, drainage, concrete and iron works, and the different kinds of art trades, printing, lithography, and chemical engraving. A third group deals with commercial subjects. In addition to these we have a number of lower technical schools adapted for home industries, for instance, schools of weaving, carving, basketmaking, lace-making, etc. Finally, household schools and schools for needlework and dressmaking must not be forgotten. These schools for home industries are of the greatest importance in an overpopulated country like Germany, or a country poor in agriculture like the Alpine districts of Austria, and they are accordingly beginning to attract the attention of the state in a very high degree. Particularly in Austria the organizers of home industries have in some places succeeded by good schools in so raising the standard of production as to lead to a not inconsiderable export and to increase the prosperity of districts possessing no advantages of the soil, in a manner undreamed of before. The establishment of day trade schools has sometimes been the cause of more economic and social profit in these cases than in the large industries. Our magnificently developed chemical industry as well as our food industries are at present almost entirely without technical middle schools. Neither are there any public day trade schools for the clothing branches of industry. But the chemical industry is admirably provided with higher officials by our scientific schools, and numerous private schools (millers' schools, brewers' schools, tailors' academies, and women's schools) provide instruction in the clothing and some food industries.

In Germany, with an area of 540,000 square kilometers, that is, about one-third of the seventeen northern states, the number of technical day trade schools supported by states, provinces, or parishes, and therefore public schools, amounts in round numbers to five hundred. There are about the same number of agricultural schools. Among the industrial and trade schools are nine technical universities, three mining academies, and five commercial universities; twenty higher and eighteen lower technical

middle schools for the various metal industries, nearly forty middle schools for the weaving industry, nearly fifty for the building trades, about twenty for the wood trade, twenty-five so-called *Kunstgewerbeschulen*, and thirty more for special branches of art trades. Still greater is the number of higher and lower technical middle schools in Austria, which has been systematically spreading a net of these schools over all its states since the year 1873. It would be purposeless to give the numbers, as the Austrian system does not correspond with the German. We must be careful not to work with figures alone, in describing technical schools. People are only too prone to lose their heads over figures. But the number of schools is not the principal thing. So long as a country has pretty well what it needs, the inner organization of its schools and their relation to the requirements of its industries are of infinitely more importance.

In order to give a picture of this inner organization and its relation to industry let me consider some of the principal groups, the schools for the metal industry, the schools for the weaving industry, and the schools for the building trades.

Among the schools for the metal industry the most numerous are the royal schools for machinery and technical electricity. They are mostly higher technical middle schools, combined in some cases with lower technical middle schools. In Prussia there are fifteen of these: Aachen, Altona, Breslau, Cöln, Dortmund, Duisburg, Elberfeld, Essen, Gleiwitz, Görlitz, Hagen, Kiel, Magdeburg, Posen, Stettin; in Bavaria there are two higher and three lower schools. Those Prussian towns in which cutlery and hardware are developed have in addition special trade schools—royal trade schools for hardware in iron and steel: for instance, Remscheid, Schmalkalden, Siegen, and Solingen, which export their wares over the whole world. All these schools, and especially the schools for machinery, have developed from the most modest beginnings. They were originally in Prussia, in the first half of the last century, so-called provincial trade schools. They had to teach simply artisans and foremen, and took their pupils at the age of fourteen from the elementary school. In the year 1870 there were about thirty such schools.

At this date they were reorganized. Admittance was granted only to pupils who had passed through the five lower classes of our general middle schools. This means going far beyond the mental horizon of the elementary-school pupil. These schools underwent a second transformation in the year 1878. Most of them were then changed into middle schools with nine classes, for purposes of general education, the so-called *Oberrealschulen* of today. Only five of the old schools retained the organization of a so-called technical middle school (Gleiwitz, Breslau, Hagen, Barmen, Aachen). The third transformation took place in the year 1880. In this year a higher technical middle school for machinery, of the kind already described, was established in the town of Cöln. A lower technical middle school, a so-called foremen's school, was attached to it. A few years later a similar school was established in Dortmund, and ever since this system has been adhered to. The development of schools in Bavaria has proceeded on the same lines as in Prussia, since the last decade of the last century.

The development of the lower schools for machinery in Prussia has been exceedingly satisfactory, and the pupils turned out by them have been able to meet all the requirements of industry. They have never trained foremen. They give men from the primary school with long practical experience a technical training suitable to the preparation they have received, and leave the manner of their subsequent occupation to industry. The teaching lays special stress on the training of the understanding for the principles of mechanics and the laws of solid bodies. It comprises the elements of mathematics (addition, subtraction, multiplication, and division, powers, square and cubic roots, equations of first and second degree, geometry, trigonometry, and the calculation of surfaces and contents of simple solids); mechanics (the laws of the elementary statics and dynamics of solid and fluid bodies, the laws of solid bodies); physics (heat, gases, fundamental laws of optics); chemistry (the elements and the chemical compounds that are important in machinery, metals and metaloids); technical drawing (drawing in projection, geometrical and freehand drawing, and especially freehand sketch-

ing); mechanical technology (founding, forming, forging, rolling, etc.); the most important tools and machines for metal and wood, the most important parts of machines, the elements of machine-building, the principles of technical electricity, simple building-constructions, sometimes practical exercises in physical and electrotechnical laboratories, for taking measurements with the simplest instruments. To this must be added instruction in German, arithmetic, the writing of cost-estimates, and the inspection of factories. All these subjects are spread over four half-yearly terms. The certificate awarded at the end of the course gives the right to the title of master and to the engagement of apprentices. Therefore we call these schools "privileged schools."

It is not devoid of interest to note the answers given by leaders in industry to inquiries lately made by the "German Committee for Technical Schools" with a view to more thorough organization. They point out that it matters little how far the pupil advances in the different subjects of instruction, but it matters a great deal whether he is thoroughly grounded in them; that it is not a question of increasing theoretical knowledge but of enlarging practical experience; that these lower technical schools train too many office men and too few foremen, fitters, and masters; that their chief aim should be to develop readiness of apprehension, the ability to draw, business capacity, and interest in natural science; that men who have passed through the state schools have on an average a better general and technical education than the pupils of private schools, and that it would therefore be in the interest of industry if all technical schools in Germany were exclusively in the hands of the state. In many cases the answers assert that even at admittance the very greatest attention should be paid to the practical experience possessed by the candidate. Four years are not considered sufficient. They demand a four-year apprenticeship and after this four years' work as journeymen. And they urge the necessity of advising the pupils on leaving school not to crowd into the offices, but to seek positions in the workshops, which stand higher in repute and are better paid than the former.

The higher schools for machinery go considerably farther than these just described. They presuppose a fairly good general education, such as is gained in a six-class middle school in Germany, and generally demand in addition two years' practical work. On this they base a curriculum of two and a half years' instruction. The subjects taught are in the main the same as those of the lower machinery schools, but they are treated more scientifically and give the pupils the knowledge requisite for simple construction under supervision or for reproduction. In mathematics the pupils go as far as differential and integral calculus; in mechanics, to which the greatest attention is paid, they study the elements of heat in physics, machine-building, and technical electricity, and they receive particularly careful instruction, both theoretical and practical, in laboratories especially fitted up for these three subjects. All proprietors of works and factories lay stress on the importance of laboratories, and the *Memorial on the Technical Schools of Germany* points out that many of them mention the necessity of technical experiments and continued observations that might well be placed in the hands of men trained in technical middle schools. Naturally great importance is attached to training in drawing, not only geometrical drawing but freehand sketching, and on the reproduction of machines and parts of machines from memory. Many regard education in the faculty of space-conception as absolutely necessary in these schools. In mechanical technology the pupil is introduced to tools and machines, to smelting, founding, forging and rolling processes, and to the study of raw materials; in building construction, to the combinations of stone, wood, and iron, to the construction of vaults, roofs, and staircases, and to the elements of graphic statics. To this is added instruction in business matters, book-keeping, bills of exchange, specifications, and estimates. The time allotted for everything is on an average forty to forty-two hours a week, during a course of two or two and a half years.

The pupils trained in these schools find employment in Germany not only in industry but also in the service of the state. The latter is particularly the case when they can show good

practical ability. But their number is not great. In Prussia in the year 1904 the higher schools for machinery were training nine hundred and forty pupils. If we apportion this number among the half-yearly terms, we get in round numbers one hundred and ninety pupils per term; that is to say, the higher schools for machinery throughout all Prussia turned out one hundred and ninety pupils in 1904. If we consider that probably half of these enter state service not many remain for private posts.

The technical middle schools for the metal industry are for the most part distinctly divided into higher and lower schools. This is not yet the case in the building trades. But the necessity for the division is making itself more and more felt. We are endeavoring to place working builders, that is, master masons, master stone-cutters, master carpenters, and foremen, in schools of their own, with a lower standard, and to train technical builders, both for private and state posts, exclusively in the higher middle schools, the so-called building trade schools. These schools were originally founded for the theoretical training of ordinary builders. The first school of the kind was established as a private undertaking in the year 1820 in Munich by Mitterer and Schöpf, and raised to a public institution in 1823. The second school was founded in 1831 in Minden, Prussia. This was also the work of a private man, the district building-inspector Haarmann. In both cases the founders were inspired by their recognition of the fact that the theoretical knowledge and the ability in drawing of the working builders were entirely insufficient. Other building schools followed later, partly established by the state, partly by private business men, but in the latter case first subsidized by public money and eventually passing into the hands of state or commune as public schools. But they were all founded as lower middle schools. Not till later, after state and commune had begun to require a certain class of technical workmen, and after the public for its own security had begun to take an interest in the training of private builders, was the standard of these schools raised. To these external causes we must add an internal cause, which has made itself apparent in all technical schools in the course of their historic develop-

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ment. Every school has in itself a motive for progressive expansion. This process of transformation is seen not only in Germany, but in all countries. It may even be a danger for technical schools, in spite of its intrinsic justification. The teacher is constantly seeking to make his instruction wider and more thorough, and this pushes the pupil, at first unintentionally, beyond the limits of artisanship. But as it is impossible for a trade to flourish which is being automatically drained of its most intelligent members, it must be a fundamental principle, in the organization of all technical schools, to preserve the pupils' joy and interest in personal, manual work.

In Germany there are at present forty-five higher technical middle schools for builders. They are trade schools, and train their pupils in five half-yearly terms to become either independent masters or assistant workmen for office or building (drawers and foremen), or technical workmen for the state, the army, the railway, or the municipality. The conditions of admittance are: an age of sixteen, an entrance examination, or the certificate for the voluntary, one-year military service, and, as in the machinery schools, practical work of at least twelve months' duration. Exceptions are sometimes made to the last condition. In South Germany the four half-yearly terms are frequently placed in the winter months, so that the pupils can return to practical building-work during the summer. Paragraph 89 of the German Military Law allows pupils who have passed the final examination with honors certain privileges in going in for the examination for the one-year voluntary military service.

Most German building-trade schools have been equipped for building above ground, but some few also embrace underground building, as well as iron construction and concrete building. Instruction in German trade schools for building above ground generally embraces the practical subjects, construction, drawing, the theory of building and composition, and also the preparatory subjects, such as algebra, plane geometry, geometry of solids, and trigonometry, physics, chemistry, projection, freehand drawing, modeling, surveying, and the study of materials. The only general subjects are German, the theory of business and law,



and arithmetic, including cost-estimates. The number of weekly lessons is on an average forty-four, so that the weekly number during the five half-yearly terms amounts to two hundred and twenty. In the department for underground building some of these subjects are curtailed in order to gain time for instruction in earthwork, road-building, canal construction, bridge-building, railway-building, and the theory of machinery. The principal part of the hours for instruction—about one hundred and ten—is engrossed by the technical subjects, while only twelve to fifteen hours remain for general subjects.

I do not wish to say that this peculiarity of the German building schools is worthy of imitation. In fact far too little attention is paid to general culture in most German technical middle schools. In this point they compare unfavorably with the French and Austrian schools. I shall return to this subject later on, and only remark here that the reorganization of building schools in Austria of December 17, 1909, bears witness, in my opinion, to a deeper insight into the essence of true technical culture. According to the regulations of this organization it is to be the task of the new trade schools for builders to foster the study not only of technical subjects but also of those pertaining to general culture, with a view to supplying the trade with men whose education is not inferior to that bestowed in the general middle schools. Consequently these schools entitle their pupils to the one-year voluntary military service and exempt them from the theoretical part of the master builders' examination. The Austrian schools receive pupils at the age of fourteen with the education given by eight years in primary schools. These schools consist of a four years' course, which includes thorough practical teaching both in school workshops and on private and public buildings. The first practical introduction to the trade takes place in the first and second year in the school courtyard. The third year consists of two winter half-years, interrupted by a summer half-year spent in practical service on buildings, and only the fourth year is devoted entirely to theory.

I have already mentioned that the lower middle schools for builders in Germany lag far behind the higher middle schools.

They are mostly attached to the higher schools. Only in Austria have they recently been made entirely independent as building schools for artisans. They consist there of two technical courses of five months in the winter; the conditions of admittance are graduation from the primary school, apprenticeship, and three years in a continuation school.

The schools for metal-workers and builders were not founded originally to meet the requirements of trade and industry. This was, however, the case with the schools for textile industries. The introduction of the power-loom turned the workman himself into a machine. All that he had to do, or that he still has to do, is to watch the unvarying movement of a machine that is complete in itself. He has nothing to do with the process of weaving and nothing with the building of the machine. Thus he generally lacks any kind of stimulation from without, and consequently remains devoid of any higher mental or technical development. Yet even the textile industry requires intelligent workers who can be made use of as foremen and directors. This fact led manufacturers to demand the establishment of lower schools for weaving and spinning, and in some cases even to take the matter into their own hands. In other districts, where weaving was extensively carried on at home in the winter months, schools were founded in order to give peasants' daughters and servants, and young men as well, an opportunity of at least learning how to make linen, half-linen, and cotton fabrics for personal use. This last object was the origin of the numerous weaving workshops in Hanover and Silesia. As the artistic taste for hand-woven carpets, curtains, and furniture covers is increasing in Germany, it is not improbable that these simple opportunities of instruction will spread still farther in poor districts, as has been the case in Sweden. Later on, after the number of power-looms had multiplied exceedingly, and the processes of weaving wool, cotton, linen, silk, and velvet had been correspondingly developed, the sons of manufacturers began to feel the need of higher schools. The foundation of these higher schools was also favored by the desire on the part of the manufacturers to make themselves independent of foreign

countries. In the first half of the nineteenth century young men who wished to learn the secrets of weaving were forced to go, at great expense, to Lyons, where both public and private weaving schools had long existed.

German industry was also greatly hampered by the difficulty of procuring patterns, and the necessity of training pattern draughtsmen became self-evident. Courses in drawing had become especially indispensable in the schools for the woolen industry, in which the pattern is generally attended to by the same employee who has the post of supervision in the machine-room. The higher weaving schools could be made use of for this purpose. A factory-pattern drawing school was soon attached to the oldest German weaving school, in Elberfeld, founded in 1845. A second weaving school was founded in 1854 at Mülheim on the Rhine, and a third in 1855 at Krefeld. The Elberfeld school was also enlarged, at the suggestion of the manufacturers, by a chemical department for dyers, printers, and bleachers. In the same manner the development of German trade made it necessary to add commercial courses to the weaving schools, for the instruction of clerks in drapers' shops and factories in the knowledge of wares and the processes of work in the different branches of the textile industry. And finally the weaving schools are sometimes combined with courses for dressmaking, frequented mostly by female pupils. These courses are most numerous in Berlin, the principal seat of dressmaking in Germany.

The technical middle schools for textile industry are particularly developed in Prussia, where they were reorganized in the year 1896, as a result of conferences held between the directors of the weaving schools and experts in the trade. The influence of the textile industry made itself particularly felt on this occasion in the specialization of the different schools in the various districts in the kinds of weaving for which they were required. In this point also the technical middle schools for the textile industry are distinguished from those of the metal and building trades. In the latter, as opposed to the textile schools, there is

a strong tendency toward unification, special stress being laid on the technical basis common to all the different branches of the trade. Later on Bavaria followed the example of Prussia.

In the conditions laid down for the admission of pupils to the lower and higher weaving schools it became clear that neither state nor municipality had the same need for skilled technical workmen in textile branches that they had in the metal and building trades. Admittance to the higher and lower middle schools is generally granted to all pupils in possession of a fair school-training. It is left to the discretion of the director to exclude pupils with insufficient training from the higher schools. One year's practical work is usually required of the pupils before entrance. The higher weaving schools generally comprise three half-yearly courses, and the lower weaving schools have generally a half-year course; in each half-year course there are about forty-four lessons a week. In the higher schools these lessons are divided among the following subjects: setting up the frames, putting in and taking out the patterns, machines, materials, dyes, designing, and the law concerning the trade. These subjects are treated differently, according to whether the school is arranged for the woolen, half-woolen, linen, half-linen, jute, or cotton industry. The lower, half-year, weaving schools deal with the same subjects, which are of course considerably reduced in amount. The number of day trade schools for the textile industry in Germany is twenty-seven. There are in addition a great number of workshops and schools for teaching weaving, lacemaking, and embroidery.

Besides these three large groups of public trade schools, supported with public money, by the state and municipalities, with which we must also reckon the South German trade schools for the wood industry (which are, however, without exception devoted exclusively to the training of master artisans), there still remain a certain number of trade schools dispersed through the country in the service of the most various trades, and supported partly by public money, partly by employers' associations, partly by purely private means. Saxony is the country that possesses the greatest number of trade schools. It would take us too

far to discuss these schools, although we should meet very interesting institutions among them, especially adapted to be of use in smaller trades. Day trade schools with a longer and a shorter curriculum are also attached to these German continuation and artisans' schools. For instance, day trade schools for joiners, art-locksmiths, jewelers, goldsmiths, book-binders, stone-carvers, decorators, machine-drawers, and builders are affiliated with the continuation schools in Munich. These trade schools seek to inspire new life in handicrafts that here as in all other countries have suffered cruelly from the advance of industry. There are similar day trade schools connected with continuation schools in most German towns. The most prominent among these are the German art-handicraft schools (*Kunstgewerbeschulen*), of which at present about forty are supported by public money, and which embrace a great number of different day trade schools for different branches of art-trades.

Before I conclude let me recapitulate the foregoing statements and at the same time institute a comparison between the German and the American schools. We may say that most German day trade schools had their origin in endeavors to improve the condition of small trades. They commenced at a time in which industry played no important part in Germany. In the same measure as industry developed, and still more when the state began to require capable technical workers of a middle grade, did these day trade schools also begin to expand beyond the limits of their first purpose. The next step is the division into two departments, an upper one for better trained technical assistants and a lower one for artisans. The imperial German labor law had an extremely favorable influence on the development of this lower department. But the manner of their origin proves that they were not meant to replace apprenticeship to a master or manufacturer; on the contrary, they more or less presuppose practical schooling in trade and industry, and make it their office to fill the gaps left by this purely practical schooling, to widen practical experience, to teach the working classes the science and art of their vocations, and as far as possible to give

them a business training. The system of apprenticeship is not dying out in Germany. Thanks to the imperial German labor law and the continuation and lower trade schools it has fostered, and thanks as well to institutions for the furtherance of trade, and the consequent increase in skilled production, apprenticeship has gained in educational value not only in trades but also in industries. Schools that replace apprenticeship are rare in Germany. In Austria and Switzerland schools of this kind have existed for the last twenty years, but during these twenty years they have remained at a standstill. Nor can I discover any strong inclination in these three countries to spend public money on such schools. These countries have also kept the primary school free from specialized industrial education. On the other hand, during the last ten years we have been continually laying more stress on the introduction of manual training into the elementary schools, or, as I express it, on the transformation of textbook schools into working schools. In the Munich primary schools we have in the eighth class five hours' wood and metal work a week for all boys, needlework and domestic science with teaching in the school kitchen for all girls. In many German schools, as well as in Swiss schools, and still more in Swedish schools, we find the demand of the Circular of the New York Education Department of February, 1910, to the effect that industrial arts of a more general character are to be introduced in the primary grades as well as in the grammar grades, more and more frequently realized.

If I seek to compare German and American trade schools, I find that our higher trade schools most resemble your technical colleges. Only we must not forget that there is no transition contemplated from our higher trade schools to our technical universities, and that one or two years' practical work must either be presented or taken in special preparatory courses before admittance to the school.

Our numerous lower trade schools have no counterpart in the United States. The trade schools of the United States are generally intended to take the place of apprenticeship. The German trade schools on the other hand are intended, with few

exceptions, to make up for the deficiencies of apprenticeship. Only the trade schools for girls take the place of apprenticeship, because no good system of apprenticeship exists for girls' trades, such as millinery, dressmaking, cooking, kitchen-management, shirtmaking, etc., as it does for boys. If in Germany the system of apprenticeship should ever approach to a similar decay, then, in my opinion, there would be no other plan for industrial schools than the establishment of specialized trade schools for all trades, beginning at the close of the elementary school and extending over four years. For there are only two roads for the industrial education of the masses: either a good system of apprenticeship, with trade schools that supply the wants of and broaden education, as do our Munich continuation schools, or specialized trade schools. There are no other means to this end. Capacity in industry and trade flourishes only on the soil of early, thorough, and many-sided technical, business, and civic training. If the public life does not give this, then the public school must give it, or industry will decay. The intermediate industrial schools recommended by the above-mentioned circular of the New York Education Department will perhaps help this result in the United States, but, on the other hand, they may grow unawares into specialized trade schools. Furthermore, the principles inculcated by the same circular for the organization of these trade schools are excellent, especially the three which demand "that the trade schools should absolutely abandon all college-preparatory work, that all instruction in mathematics and science must be such as to be directly usable, and that trade schools must necessarily take on varying forms in different localities." These trade schools then become admirable institutions for the affiliation of continuation and evening schools, precisely as they are in Germany. But before we proceed to a system of trade schools spread over the whole country and intended to replace apprenticeship, we should first make the most detailed inquiries as to the causes of the decline of the old system of apprenticeship and use every means at our disposal to stop it. For however good such trade schools may be, they

have, besides their immense cost, other defects which have so far considerably checked their diffusion in Europe.

It is of course beyond doubt that at the present moment the German trade schools are of great use to German trade and industry. But it is not easy to determine to what extent the day trade schools have contributed to the development of German industry and commerce. It appears to me certain that they have not been the prime factor.

I pointed out at the beginning that the number of men turned out by the Prussian higher schools for machine-building is far too small, even if one half were to join the ranks of industry every year, to be of any appreciable influence. The middle trade technical workers required yearly by German industry must amount to at least tenfold the number now furnished by the schools. I can give you a still stronger proof of the truth of this assumption. In the course of this year the Bavarian government had occasion, for the purpose of reorganizing the building-trade schools, to make an inquiry in the one hundred and forty-three districts of the country as to the number of independent builders. They asked what percentage had passed through the building-trade school. The number of independent builders in the one hundred and forty-three districts of the kingdom amounted to nine thousand four hundred and one. Among these there were only six hundred and seventy-two, or 7 per cent, who had passed through the entire curriculum of a building-trade school, and fourteen hundred and sixty, or 15½ per cent, who had taken single half-year courses. Thus nearly 80 per cent of all independent builders had been to no trade school at all; many of these had been to a higher general school, and many had enjoyed no other teaching than that of the primary and continuation schools.

Considerable influence on industrial education will probably be exercised by the continuation schools of the German Empire, which have recently undergone a remarkable extension. These schools are also supported by public money. Their influence is naturally greatest in towns and states in which their organization, like that of Munich, provides not only drawing and com-



mercial training, but also, by means of workshops, purely technical training as well. There can be no doubt that these continuation schools, which begin where the elementary school ceases and carry on the education of all youthful workers, whether apprentices or not, without exception, from their fourteenth to their eighteenth year, raise the standard of character in the masses, who without them would be mostly without secondary education. Thanks to these continuation schools, even the poorest and least favored by circumstances need not remain without further education. And thanks to the fact that the German continuation schools appeal to the vocation of the pupil and turn it to account as the starting point of education, every youthful workman can profit by them in his own particular calling. In states outside Prussia there is hardly a town without a compulsory continuation school. In the states of South Germany there is not a single exception.

I nevertheless attribute the lion's share in the rise of German industry and commerce to other causes. Possibly one of the chief of these is the German character, with its tendency to reflection, its thoroughness, tenacity, and capacity for subordination. Another cause is perhaps the German merchant, with his flexibility, his adaptability, and his zeal in the study of foreign languages and foreign conditions. A third cause may have been German poverty. Before 1870, when the German Empire became a great political and at the same time a great economic power, Germany was a poor country. Now nothing is better calculated to develop the innate forces of a people than poverty. The mental versatility of the Germanic races, Swedes, Norwegians, Scotch, and English, is possibly chiefly to be ascribed to the fact that they have been forced for thousands of years to strain every nerve in the struggle against fate. One of the best weapons that poor races possess for this struggle is their faculty of dispensing with things. The Germany of today has grown rich within one generation. It remains to be seen if it has strength enough, in spite of its wealth, to work and struggle in the sweat of its brow. History generally teaches the contrary. Yet our overpopulation and the tension existing

in all other civilized states may perhaps supply us with the same motives that we formerly owed to poverty.

One factor, however, has certainly been of eminent importance in the development of German industry. That is the scientific training of German engineers; in other words, the serious scientific spirit that rules in our German technical universities. In the great decisions of the battlefield it is the capacity of officers and leaders, with their military discipline and their iron sense of duty, that turns the balance of the day. A small band with the right man at its head may cope with ten times its number under an indifferent leader. The same thing applies to the technical officers on the field of industrial fight. The scientific mind that guides the German engineers, which grew out of the German middle schools with their rigorous expectations and their firmly established school discipline, is a chief factor in industry, equaled only by the earnest German scholar, who devotes his life to the investigation of purely scientific problems in the laboratories of our universities, without regard to their practical possibilities and with no concern for material profit. When Professor Baeyer in Munich spent years in the attempts to make artificial indigo, before these attempts were crowned with such brilliant success, it was neither use nor money that stimulated him, but only the great problem of transforming inorganic substances into a color that had hitherto been a product of vegetable vitality. And among other economic causes it is certainly this spirit of unselfishness, of devotion to an ideal aim, that has led our technical officers of industry to victory.

We thus arrive at the conclusion that real scientific culture in union with that discipline of character which teaches thoroughness and devotion to aims lying outside of ourselves are of no less importance for the industrial development of a country than technical training. Technical capacity alone will not suffice. In my opinion, the German day trade schools suffer from the fact that they pay almost exclusive attention to technical training. I have already repeatedly remarked that the courses of instruction in our technical day trade schools differ undesirably

